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International application number: PCT/US05/004133

International filing date: 10 February 2005 (10.02.2005)

Document type: Certified copy of priority document

Document details: Country/Office: US
Number: 10/925,331
Filing date: 24 August 2004 (24.08.2004)

Date of receipt at the International Bureau: 14 March 2005 (14.03.2005)

Remark: Priority document submitted or transmitted to the International Bureau in compliance with Rule 17.1(a) or (b)

World Intellectual Property Organization (WIPO) - Geneva, Switzerland
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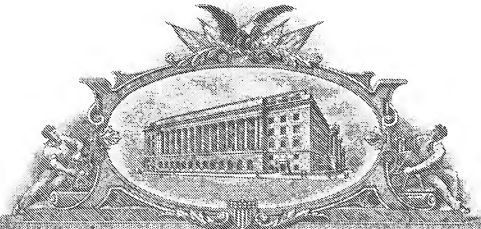

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APPLICATION NUMBER: *10/925,331*
FILING DATE: *August 24, 2004*
RELATED PCT APPLICATION NUMBER: *PCT/US05/04133*

Certified by

Jon W. Dudas

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for Intellectual Property
and Director of the United States
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UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new nonprovisional applications under 37 C.F.R. 1.53(b))

Attorney Docket No.	2839.2.10
First Inventor	K Donald Evans
Title	MULTIUSE, SOLID CLEANING DEVICE AND COMPOSITION
Express Mail Label No.	EV406338455US

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents.

1. ☒ Fee Transmittal Form (e.g., PTO/SB/17) *(Submit an original and a duplicate for fee processing)*
2. ☒ Applicant claims small entity status. See 37 CFR 1.27.
3. ☒ Specification [*Total Pages* 25] *(preferred arrangement set forth below)*
   - Descriptive title of the Invention
   - Cross Reference to Related Applications
   - Statement Regarding Fed sponsored R & D
   - Reference to sequence listing, a table, or a computer program listing appendix
   - Background of the Invention
   - Brief Summary of the Invention
   - Brief Description of the Drawings *(if filed)*
   - Detailed Description
   - Claim(s)
   - Abstract of the Disclosure
4. ☒ Drawing(s) (*35 U.S.C.113*) [*Total Sheets* 4]
5. Oath or Declaration [*Total Pages* 3]
   a. ☒ Newly executed (original or copy)
   b. ☐ Copy from a prior application (37 CFR 1.63 (d)) *(for a continuation/divisional with Box 18 completed)*
      i. ☐ DELETION OF INVENTOR(S) Signed statement attached deleting inventor(s) named in the prior application, see 37 CFR 1.63(d)(2) and 1.33(b).
6. ☐ Application Data Sheet. See 37 CFR 1.76

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7. ☐ CD-ROM or CD-R in duplicate, large table or Computer Program *(Appendix)*
8. Nucleotide and/or Amino Acid Sequence Submission *(if applicable, all necessary)*
   a. ☐ Computer Readable Form (CRF)
   b. Specification Sequence Listing on:
      i. ☐ CD-ROM or CD-R (2 copies); or
      ii. ☐ paper
   c. ☐ Statements verifying identity of above copies

ACCOMPANYING APPLICATIONS PARTS

9. ☒ Assignment Papers (cover sheet & document(s))
10. ☐ 37 C.F.R.§3.73(b) Statement ☐ Power of Attorney *(when there is an assignee)*
11. ☐ English Translation Document *(if applicable)*
12. ☐ Information Disclosure Statement (IDS)/PTO-1449 ☐ Copies of IDS Citations
13. ☐ Preliminary Amendment
14. ☒ Return Receipt Postcard (MPEP 503) *(Should be specifically itemized)*
15. ☐ Certified Copy of Priority Document(s) *(if foreign priority is claimed)*
16. ☐ Nonpublication Request under 35 U.S.C. 122 (b)(2)(B)(i). Applicant must attach form PTO/SB/35 or its equivalent.
17. ☒ Other: Express Mail Certificate

18. If a CONTINUING APPLICATION, *check appropriate box, and supply the requisite information below and in a preliminary amendment, or in an Application Data Sheet under 37 CFR 1.76:*

☐ Continuation ☐ Divisional ☒ Continuation-in-part (CIP) of prior application No: 10/775,264

Prior application information: *Examiner* __ *Group / Art Unit:*

For CONTINUATION or DIVISIONAL APPS only: The entire disclosure of the prior application, from which an oath or declaration is supplied under Box 5b, is considered a part of the disclosure of the accompanying or divisional application and is hereby incorporated by reference. The incorporation can only be relied upon when a portion has been inadvertently omitted from the submitted application parts.

19. CORRESPONDENCE ADDRESS

☒ *Customer Number* 21552 or ☒ *Correspondence address below*

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City		*State*		*Zip Code*	
Country		*Telephone*		*Fax*	

Name (Print/Type)	Evan R. Witt	*Registration No. (Attorney/Agent)*	32,512
Signature		*Date*	8/24/2004

PTO/SB/17 (10-03)
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FEE TRANSMITTAL for FY 2004

Effective 10/01/2003. Patent fees are subject to annual revision.

☒ Applicant claims small entity status. See 37 CFR 1.27

TOTAL AMOUNT OF PAYMENT ($) 551.00

	Complete if Known
Application Number	
Filing Date	
First Named Inventor	K Donald Evans
Examiner Name	
Group / Art Unit	
Attorney Docket No.	2839.2.10

METHOD OF PAYMENT (check all that apply)

☐ Check ☒ Credit card ☐ Money Order ☐ Other ☐ None

☒ Deposit Account:

Deposit Account Number: 13-0763

Deposit Account Name: Madson & Metcalf

The Commissioner is authorized to: *(check all that apply)*

☒ Charge fee(s) indicated below ☒ Credit any overpayments
☐ Charge any additional fee(s) during the pendency of this application
☐ Charge fee(s) indicated below, except for the filing fee to the above-identified deposit account.

FEE CALCULATION

1. BASIC FILING FEE

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
1001	770	2001	385	Utility filing fee	385.00
1002	340	2002	170	Design filing fee	
1003	530	2003	265	Plant filing fee	
1004	770	2004	385	Reissue filing fee	
1005	160	2005	80	Provisional filing fee	

SUBTOTAL (1) $ 385.00

2. EXTRA CLAIM FEES

			Extra Claims		Fee from below	=	Fee Paid
Total Claims	34	- 20 **	14	X	9	=	126
Independent Claims	2	- 3 **	0	X	86	=	0
Multiple Dependent				X	145	=	0

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description
1202	18	2202	9	Claims in excess of 20
1201	88	2201	43	Independent claims in excess of 3
1203	290	2203	145	Multiple dependent claim, if not paid
1204	86	2204	43	** Reissue independent claims over original patent
1205	18	2205	9	** Reissue claims in excess of 20 and over original patent

SUBTOTAL (2) $ 126.00

**or number previously paid, if greater; For Reissues, see above

FEE CALCULATION (continued)

3. ADDITIONAL FEES

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
1051	130	2051	65	Surcharge - late filing fee or oath	
1052	50	2052	25	Surcharge - late provisional filing fee or cover sheet	
1053	130	1053	130	Non-English specification	
1812	2,520	1812	2,520	For filing a request for reexamination	
1804	920*	1804	920*	Requesting publication of SIR prior to Examiner action	
1805	1,840*	1805	1,840*	Requesting publication of SIR after Examiner action	
1251	110	2251	55	Extension for reply within first month	
1252	420	2252	210	Extension for reply within second month	
1253	950	2253	475	Extension for reply within third month	
1254	1,480	2254	740	Extension for reply within fourth month	
1255	2,010	2255	1,005	Extension for reply within fifth month	
1401	330	2401	165	Notice of Appeal	
1402	330	2402	165	Filing a brief in support of an appeal	
1403	290	2403	145	Request for oral hearing	
1451	1,510	1451	1,510	Petition to institute a public use proceeding	
1452	110	2452	55	Petition to revive – unavoidable	
1453	1,330	2453	665	Petition to revive – unintentional	
1501	1,330	2501	665	Utility issue fee (or reissue)	
1502	480	2502	240	Design issue fee	
1503	640	2503	320	Plant issue fee	
1460	130	1460	130	Petitions to the Commissioner	
1807	50	1807	50	Processing fee under 37 CFR 1.17 (q)	
1806	180	1806	180	Submission of Information Disclosure Stmt	
8021	40	8021	40	Recording each patent assignment per property (times number of properties)	40
1809	770	2809	385	Filing a submission after final rejection (37 CFR § 1.129(a))	
1810	770	2810	385	For each additional invention to be examined (37 CFR § 1.129(b))	
1801	770	2801	385	Request for Continued Examination (RCE)	
1802	900	1802	900	Request for expedited examination of a design application	

Other fee (specify) _____

*Reduced by Basic Filing Fee Paid **SUBTOTAL (3)** $ 40.00

SUBMITTED BY					Complete (if applicable)
Name (Print/Type)	Evan R. Witt	Registration No. Attorney/Agent	32,512	Telephone	801-537-1700
Signature	Evan R Witt			Date	August 24, 2004

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This collection of information is required by 37 CFR 1.17 and 1.27. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you are required to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. **DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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PATENT APPLICATION
Docket No.: 2839.2.10

CERTIFICATE OF MAILING BY "EXPRESS MAIL"

"Express Mail" Mailing Label No.: EV406338455US

Date of Deposit: August 24, 2004

I hereby certify that this patent application in the name of K Donald Evans et al. for MULTIUSE, SOLID CLEANING DEVICE AND COMPOSITION, together with drawings, a Declaration for Utility Patent Application, an Assignment and Recordation Form Cover Sheet, a Utility Patent Application Transmittal Form, a Fee Transmittal Form, a Non-Publication Request Form and two Credit Card Payment Forms for the amounts of $511 and $40 are being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 C.F.R. § 1.10 on the date indicated above in an envelope addressed to Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

Respectfully submitted,

Evan R. Witt
Reg. No. 32,512
Attorney for Applicant

Date: August 24, 2004

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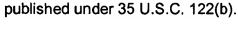
NONPUBLICATION REQUEST UNDER 35 U.S.C. 122(b)(2)(B)(i)

First Named Inventor	K Donald Evans
Title	MULTIUSE, SOLID CLEANING DEVICE AND COMPOSITION
Atty Docket Number	2839.2.10

I hereby certify that the invention disclosed in the attached application **has not and will not be** the subject of an application filed in another country, or under a multilateral agreement, that requires publication at eighteen months after filing.

I hereby request that the attached application not be published under 35 U.S.C. 122(b).

August 24, 2004
Date


Signature

(801) 537-1700
Telephone Number

Evan R. Witt
Typed/Printed Name

This request must be signed in compliance with 37 CFR 1.33(b) and submitted with the application **upon filing.**

Applicant may rescind this nonpublication request at any time. If applicant rescinds a request that an application not be published under 35 U.S.C. 122(b), the application will be scheduled for publication at eighteen months from the earliest claimed filing date for which a benefit is claimed.

If applicant subsequently files an application directed to the invention disclosed in the attached application in another country, or under a multilateral international agreement, that requires publication of applications eighteen months after filing, the applicant **must** notify the United States Patent and Trademark Office of such filing within forty-five (45) days after the date of the filing of such foreign or international application. **Failure to do so will result in abandonment of this application (35 U.S.C. 122(b)(2)(B)(iii)).**

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PATENT APPLICATION
Docket No. 2839.2.10

UNITED STATES PATENT APPLICATION

of

K Donald Evans

Cory E. Cook

and

Eddie Lee Caruthers Jr.

for

MULTIUSE, SOLID CLEANING DEVICE AND COMPOSITION

MULTIUSE, SOLID CLEANING DEVICE AND COMPOSITION

CROSS-REFERENCED RELATED APPLICATIONS

[0001] This application is a continuation-in-part of Application No. 10/775,264, filed February 10, 2004, which is a continuation-in-part of Application No. 10/144,331, filed May 13, 2002, which is a division of Application No. 09/437,532, filed November 10, 1999, Patent No. 6,403,551. Application No. 10/775,264, filed February 10, 2004, claims the benefit of U.S. Provisional Application No. 60/448,239, filed February 18, 2003. The foregoing applications are incorporated by reference.

BACKGROUND OF THE INVENTION

[0002] The present invention relates to a multiuse, solid cleaning composition. More specifically, the present invention is drawn to compositions for cleaning with water, including slow release compositions which provide consistent concentrations of cleaning agents delivered into water over multiple wash cycles.

[0003] Chemical cleaning agents, in one form or another, have long been used to remove dirt, oil, and particulate matter from a wide variety of articles. Cleaning improves the visual and tactile impression of an article, kills potentially harmful microbes, removes particles that interfere with breathing and vision, and may even extend the life of the article being cleaned. Things such as cookware, homes, automobiles, clothing, and the human body itself stand to benefit from the development of enhanced cleaning agents. Although the present invention contemplates cleaning systems useful for cleaning a wide variety of articles, it is particularly well-adapted for cleaning clothes, as in a washing machine.

[0004] Soaps and detergents are two of the most common cleaning agents presently used. While they are often used interchangeably, the words "soap" and "detergent" actually denote different classes of compounds.

[0005] Soaps are made by a process of saponification wherein a fatty acid reacts with a base to yield the salt of the fatty acid, *i.e.*, a soap. Soap probably has its origin in reacting animal fats, or lard, with alkaline salts, such as wood ash. Today, they are largely synthesized from animal fats and plant oils. Molecules of soap owe their cleaning capacity to their amphiphilic structure, which includes a hydrophobic portion consisting of a long hydrocarbon chain, and a

hydrophilic portion composed of an ionic group at one end of the hydrocarbon chain. Because of the hydrocarbon chain, a molecule of soap is not truly soluble in water. Numerous molecules of soap will suspend in water as micelles, or clusters of molecules with long hydrocarbon chains in the inner portions of the cluster, and ionic, water soluble ends facing the polar water.

[0006] Because these micelles form hydrophobic centers, they are able to dissolve other non-polar substances, like oils. Once the non-polar, oily dirt is dissolved within the micelles of soap, the ionic surfaces of the micelle repel each other, suspending the oil droplets and preventing them from coalescing. In this fashion, dirt and oil become trapped within the water soluble micelles, and wash away with the water.

[0007] A primary disadvantage of soaps is that they form insoluble salts (precipitates) with ions found in hard water. These salts, usually formed when Ca^{++} and Mg^{++} ions react with the carboxylate ends of soap molecules, precipitate out of solution as bathtub rings, grits, and other deposits. Water softeners that exchange Ca^{++} and Mg^{++} ions for more soluble Na^{+} ions can alleviate most of this problem.

[0008] Most laundry products and many household cleansers actually contain detergents, not soaps. A detergent is a compound with a hydrophobic hydrocarbon chain plus a sulfonate or sulfate ionic end (whereas soaps have carboxylic ends). Because detergents also have an amphiphilic structure, they also form micelles and clean in the same fashion as soaps. However, detergents have the advantage that most metal alkylsulfonates and sulfates are water-soluble. Therefore, detergents do not precipitate out of solution with metal ions found in water. As a result, detergents are not inhibited by hard water. In addition, detergents can be synthesized with continuous chain alkyl groups, which are more easily broken down, or biodegraded, into smaller organic molecules by the microorganisms in septic tanks and sewage treatment plants.

[0009] A drawback of most detergents is that they contain additives that take much longer to biodegrade. Some components containing phosphates must be treated in plants. Phosphates promote algae growth, chocking bodies of water and streams. Another disadvantage of detergents is that they can leave behind an undesirable residue even after thorough rinsing.

[0010] Detergents are currently used in many household appliances, such as dishwashers and washing machines. Presently, a user must measure out a dose of detergent to add to the

cleaning appliance before every cleaning cycle. Conventional packaging and use of detergents creates messy clutter, consumes time, and typically results in a waste of detergent from overdosing. In addition, most washing machines for clothing use a separate rinsing cycle in order to remove the residue. Thus, additional time, water, and heat energy are required to complete the washing process.

[0011] It would be a great advancement in the art to provide a novel cleaning system that uses a novel non-detergent composition of cleaner that leaves no residue and therefore, requires no rinsing cycle. Another improvement in the art would be to provide a cleaning agent that is biodegradable. Still another improvement would be if this cleaning agent were made from natural materials. It would also be a great advancement in the art to provide a new method for making a non-detergent cleaning agent. It would be another advancement in the art to provide a cleaning agent that cleans as good as or better than the detergents presently on the market.

[0012] Furthermore, it would be an improvement in the art to simplify the cleaning process and ameliorate the resultant mess with improved, preferably measurement-free or automatic, dosing over many cleaning cycles.

BRIEF SUMMARY OF THE INVENTION

[0013] In accordance with the invention as embodied and broadly described herein, a multiuse, solid cleaning device and cleaning method are disclosed in suitable detail to enable one of ordinary skill in the art to make and use the invention.

[0014] The multiuse cleaning device contains a homogeneous quantity of cleaning agent in solid form configured to slowly dissolve and release a substantially consistent quantity of cleaning agent over a plurality of wash and rinse cycles. The device may be used in various cleaning applications such as laundry and dish washing applications.

[0015] The cleaning agent includes a gas-releasing component, a solubility control component to limit the solubility of the cleaning agent, an alkalinity agent as a pH regulator, a water softener to solvate metal ions in a solution of water, and an optical brightener for increased color clarity and brightness. Gas-releasing component clean by reacting with acids (soils) and by mechanical microscrubbing as they yield gases, such as carbon dioxide. The gas-releasing component is preferably selected from carbonates, bicarbonates, perborates,

percarbonates, and mixtures thereof. Sodium perborate monohydrate, sodium percarbonate, sodium bicarbonate, sodium carbonate, and mixtures thereof are presently preferred gas-releasing agents.

[0016] The solubility control agent is a material resistant to dissolving in water, i.e., water insoluble or slightly water-soluble. It controls solubility by dissolving only an equilibrium concentration of composition in solution. The amount of solubility control component in the composition determines the equilibrium concentration of the composition in a solution, e.g., water. Therefore, the amount of solubility control component should be sufficient to yield a predetermined equilibrium concentration of the cleaning agent. Similarly, the amount of cleaning agent should be sufficient to provide a predetermined amount of gas in solution. The amount of alkalinity agent should be sufficient to provide a predetermined pH in solution. The amount of water softener should be sufficient to soften household water in solution.

[0017] U.S. Patent Nos. 6,178,987, 6,262,004, and 6,403,551 disclose a solid cleaning composition containing amorphous silica as the solubility control agent. Amorphous silica (H_2SiO_3) is a preferred solubility control agent because it occurs in nature and is completely biodegradable. In the cleaning compositions containing amorphous silica disclosed in the above-identified patents, careful heating and pressurizing is needed to prepare the cleaning compositions. It has been found that commercially available potassium silicate ($K_2O{\cdot}nSiO_2{\cdot}mH_2O$), in liquid form, may be used to prepare the cleaning agent compositions at room temperature without special heating or pressure. Other silicates, such as sodium silicate, tend to dissolve quickly and may not provide desired solubility control. However, in some cases sodium silicate may be usable within the scope of the present invention. The other ingredients may be used at approximately the same concentration reported in the foregoing patents. Completion of the process may include casting or molding the composition in a shape selected to control surface area, and curing the composition. The composition cures independently at room temperature as water becomes depleted through evaporation and/or as a result of the anhydrous compounds absorbing water.

[0018] The water softener is preferably a naturally occurring and biodegradable material capable of solvating hard water ions, such as a zeolite. Naturally occurring zeolites are presently preferred; however, the invention may be used with synthetic zeolites which function

in a manner equivalent to natural zeolites and which biodegrade. The water softener solvates hard ions and inhibits them from reacting with other components to form insoluble salts.

[0019] The cleaning agent preferably include an optical brightener present in an amount from about 0.5 to 8 % by weight, more preferably from about 0.5 to 5 % by weight, and optimally from about 0.5 to 3 % by weight. The cleaning agent may optionally include a fragrance component present in an amount from about 0.5 to 12 % by weight, more preferably from about 1 to 12 % by weight, and optimally from about 1 to 5 % by weight. The cleaning agent may optionally include an anti-redeposition component present in an amount from about 0.5 to 10 % by weight, more preferably from about 0.5 to 5 % by weight, and optimally, from about 0.5 to 3 % by weight.

[0020] The alkalinity agent is present in an amount sufficient to give a solution of the composition a pH greater than 7, and preferably a pH from about 7 to about 10.5, more preferably from 7.8 to about 8.8. Examples of alkalinity agents include, but are not limited to, an alkali hydroxide, alkali hydride, alkali oxide, alkali sesquicarbonate, alkali carbonate, alkali phosphate, alkali borate, alkali salt of mineral acid, alkali amine, alkaloid, alkali cyanide, and mixtures thereof. Sodium hydroxide is one presently preferred alkalinity agent.

[0021] In certain embodiments within the scope of the present invention, the method of preparing the solid cleaning agent may include providing a solvent, such as water; providing a gas-releasing agent, such as sodium bicarbonate, sodium percarbonate, sodium perborate monohydrate, sodium perborate tetrahydrate, and mixtures thereof; providing a water softener, such as a zeolite; providing a solubility control agent, such as potassium silicate; mixing the ingredients; pouring the mixture into a curing vessel; and allowing the composition to cure to a solid form.

[0022] A porous, elastic covering or bag may be disposed around the solid cleaning agent to hold it during use. The porous covering or bag may conform to the size of the solid cleaning agent as the cleaning agent shrinks in size due to dissolution of cleaning agent. The covering or bag helps reduce or eliminate direct transfer of cleaning agent residue onto fabric surfaces after a final rinse cycle when the cleaning device and fabric surfaces are in contact for an extended time period. The porous covering or bag may be an elastic net-like material or a woven fabric material. It may be a porous fabric bag with a covering of ruffle-like material.

[0023] The cleaning device may include a indicator structure disposed within the quantity of cleaning agent to signal when to replace the cleaning device. It may optionally include an internal skeleton within the quantity of cleaning agent to provide structural strength to the cleaning device.

[0024] The ball may be spherical, aspherical, oval, oblate, rounded, or irregular shaped. The cleaning device is preferably in the form of a ball. The size of the cleaning device may vary depending upon the concentration of the cleaning agent and its dissolution rate and the desired quantity of cleaning agent to be released in each wash or rinse cycle. For example, a more concentrated cleaning agent, with a slower dissolution rate, may have a smaller size than a device having a lower concentration cleaning agent with a higher dissolution rate. For convenience, the cleaning device may have a diameter in the range from about 2 to about 6 inches in residential applications and 4 to 12 inches in commercial/industrial applications. A device having a size approximately the same as a softball may be used. The cleaning agent in solid form dissolves and releases a substantially consistent quantity of cleaning agent over from about 5 to 25 laundry wash or rinse cycles.

[0025] In one embodiment of the cleaning agent within the scope of the present invention, the gas-releasing component is present in an amount from about 20 % to 60 % by weight, the solubility control component is present in an amount from about 20 % to 60 % by weight, the water softener is present in an amount from about 0.5 % to 20 % by weight, the alkalinity agent is present in an amount from about 0.5 % to 20 % by weight, and the optical brightener is present in an amount from about 0.5 % to 8 % by weight.

[0026] In a preferred embodiment within the scope of the present invention, the gas-releasing component is present in an amount from about 40 % to 55 % by weight, the solubility control component is present in an amount from about 35 % to 50 % by weight, the water softener is present in an amount from about 1 % to 10 % by weight, the alkalinity agent is present in an amount from about 1 % to 12 % by weight, and the optical brightener is present in an amount from about 0.5 % to 5 % by weight.

[0027] In a more preferred embodiment within the scope of the present invention, the gas-releasing component is sodium perborate monohydrate present in an amount from 42% to 52% by weight, the solubility control component is potassium silicate present in an amount from

35% to 45% by weight, the water softener is a zeolite present in an amount from 1% to 5% by weight, the alkalinity agent is sodium hydroxide present in an amount from 1% to 5% by weight, and the optical brightener is present in an amount from about 0.5 % to 3 % by weight.

[0028] A method of providing laundry cleaning agent to a laundry cleaning machine is disclosed. The method includes the step of obtaining a multiuse laundry cleaning device in a solid state containing a homogeneous quantity of cleaning agent in solid form configured to dissolve and release a substantially consistent quantity of cleaning agent over a plurality of laundry wash and rinse cycles. As mentioned above, the cleaning device may have a porous, elastic covering or bag disposed around the solid cleaning agent. The porous covering or bag may be elastic and conform to the size of the solid cleaning agent as the cleaning agent shrinks in size due to dissolution of cleaning agent. The porous covering or bag may be pliable and may not necessarily conform to the size of the solid cleaning agent. The method further includes the step of depositing the laundry cleaning device within the laundry cleaning machine tub under conditions such that the laundry cleaning device is exposed to water from the plurality of laundry wash and rinse cycles.

[0029] These and other features, and advantages of the present invention will become more fully apparent from the following description and appended claims, or may be learned by the practice of the invention as set forth hereinafter.

BRIEF DESCRIPTION OF THE DRAWINGS

[0030] Figure 1 shows a multiuse cleaning device within the scope of the present invention.

[0031] Figure 2 shows a cross-sectional view of a multiuse cleaning device.

[0032] Figure 3 shows a cross-sectional view of another multiuse cleaning device.

DETAILED DESCRIPTION OF THE INVENTION

[0033] The present invention is drawn to a multiuse cleaning device containing a homogeneous quantity of cleaning agent in solid form and to methods of manufacture and use. The cleaning agent in solid form preferably provides controlled dissolution in contact with water such that a sufficient quantity of cleaning agent is dissolved and released for use in multiple wash cycles of a cleaning appliance.

[0034] The cleaning agent composition may include a gas-releasing agent that is water soluble, and a solubility control agent that is only slightly water soluble. The gas-releasing agent provides cleaning action. However, if the gas-releasing agent is permitted to freely dissolve, the resulting cleaning solution will have an unknown or uncontrolled concentration of gas-releasing agent. Thus, it is desirable to add a solubility control agent to the cleaning agent to control its equilibrium concentration, and hence, the concentration of gas-releasing agent in the cleaning solution.

[0035] The cleaning agent may be further enhanced through the addition of an alkalinity agent and a water softener. The alkalinity agent controls the pH of the cleaning agent, and therefore the pH of the resultant cleaning solution. The pH of the cleaning solution preferably remains within a certain range because the pH controls the rate at which the gas-releasing agent reacts. The gas-releasing agent or the solubility control agent may be configured to control the pH of the cleaning solution, but a separate alkalinity agent is presently preferred. The softener prevents the formation of a residue on the items to be cleaned by solvating hard water ions. The gas-releasing agent, the solubility control agent, or the alkalinity agent may be configured to solvate hard water ions, but a separate softener is preferable.

[0036] The gas-releasing agent should not release gas in the solid state cleaning agent, but it should be able to release gas in a cleaning solution of the cleaning agent at ambient temperature. The gas-releasing agent need not react with other agents, but may simply decompose at ambient temperature to release gas. Those gas-releasing compounds that are natural and biodegradable are preferred. In some embodiments, the gas-releasing agent is a carbonate, bicarbonate, percarbonate, or perborate. For example, sodium percarbonate, which is also known as sodium carbonate peroxyhydrate, ($2Na_2CO_3 \cdot 3H_2O_2$), sodium bicarbonate, ($NaHCO_3$), sodium perborate monohydrate ($NaBO_3 \cdot H_2O$), sodium perborate tetrahydrate ($NaBO_3 \cdot 4H_2O$), and sodium carbonate (Na_2CO_3) are effective, low cost gas-releasing agents. Mixtures of gas releasing agents may be used. However, numerous other gas-releasing agents are known to those skilled in the art, and all are within the scope of the present invention. Sodium perborate monohydrate is a presently preferred gas releasing agent.

[0037] The solubility control agent should be either water insoluble or only slightly water soluble. Numerous compounds may serve this function, including but not limited to

hydrophobic compounds. Those solubility control agents that are both found in nature and biodegradable are preferred. Potassium silicate is presently preferred because it may be used to prepare the solid cleaning agent composition at room temperature.

[0038] The alkalinity agent may be selected from, but is not limited to, a group consisting of alkali hydroxide, alkali hydride, alkali oxide, alkali carbonate, alkali bicarbonate, alkali phosphate, alkali borate, alkali salt of mineral acid, alkali amine, alkaloid, alkali cyanide, alkali metal, and alkali earth metal. Sodium hydroxide is an example of one presently preferred alkalinity agent. Other alkalinity agents that tend to increase the pH of a neutral solution are familiar to those in the art, and are within the scope of the present invention. Those alkalinity agents that are both found in nature and biodegradable are preferred. Sodium carbonate provides the dual function of an alkalinity agent and a gas releasing agent. Similarly, sodium percarbonate provides alkalinity control in addition to its gas release function. Sodium hydroxide may provide the dual function of being an alkalinity agent and also a processing aid.

[0039] The softener should preferably be selected to exchange soluble sodium or other ions for the insoluble calcium and magnesium ions. Those softeners that are both found in nature and biodegradable are preferred. A cleaning agent composition wherein the softener is natural zeolite ($Na_2O{\cdot}Al_2O_3{\cdot}(SiO_2)_x{\cdot}(H_2O)_x$) is presently preferred because it occurs in nature and is completely biodegradable. Synthetic zeolites may be used provided that they perform the desired softening function and are biodegradable.

[0040] The amount of gas-releasing agent in the cleaning agent determines how much gas is released in a cleaning solution of the cleaning agent formed when the cleaning agent dissolves in a solvent, e.g., water. Therefore, the gas-releasing agent in the cleaning agent should comprise an amount sufficient to release a predetermined amount of gas in a cleaning solution of the cleaning agent. A concentration of gas-releasing agent from 20% to 60% by weight of the cleaning agent may be used, with a concentration from 40% to 55% being more preferred. In one embodiment, the concentration of gas-releasing agent is from 42% to 52% by weight.

[0041] The amount of solubility control agent in the cleaning agent determines the equilibrium concentration of the cleaning agent in the cleaning solution. Therefore, the amount of solubility control agent in the cleaning agent should be selected to yield a predetermined equilibrium concentration of cleaning agent in the cleaning solution. A concentration of

solubility control agent from 20% to 60% by weight of the cleaning agent may be used, with a concentration from 35% to 50% being more preferred. In one embodiment, the concentration of solubility control agent is about 35% to 45% by weight.

[0042] The amount of alkalinity agent in the cleaning agent affects the pH of the cleaning solution. Therefore, the cleaning agent should include an amount of alkalinity agent selected to provide a cleaning solution within a predetermined pH range. A concentration of alkalinity agent from 0.5% to 20% by weight of the cleaning agent may be used, with a concentration from 1% to 12% by weight being more preferred. Because the alkalinity agent may also provide gas releasing functionality, in the case of sodium carbonate, the actual concentration of the gas releasing agent and alkalinity agent may be outside the foregoing concentration range. In one embodiment, the concentration of alkalinity agent is about 1% to 5% by weight, providing a cleaning solution with a pH of about 8.8 after dilution inside the cleaning appliance.

[0043] The softener in the cleaning agent softens the cleaning solution by scavenging residue-forming ions. Therefore, the softener should comprise an amount of cleaning agent sufficient to soften household water. A concentration of softener from 0.5% to 20% by weight of the cleaning agent may be used, with a concentration from 1% to 10% being more preferred. In one embodiment, the concentration of the softener is about 1% to 5% by weight.

[0044] The optical brightener is an additive that improves visual appearance in cleaned fabrics. Optical brighteners are known to persons having ordinary skill in the art. An optical brightener may be added to the cleaning agent in an amount from about 0.5% to 8% by weight, and more preferably from about 0.5% to 5% by weight. In one embodiment, the concentration of optical brightener is about 0.5% to 3% by weight. One currently preferred optical brightener is sold under the tradename Tinopal by Sigma-Aldrich Co.

[0045] Water molecules may form complexes with these components and could be bound up within the cleaning agent by virtue of the process of making the cleaning agent. Water may comprise from 1% to 50% of the cleaning agent by weight. Preferably, water comprises approximately 20% by weight of the cleaning agent. It will be appreciated that some components of the cleaning agent may contain water, such as potassium silicate, which may limit the amount of extra water that needs to be mixed with the dry ingredients.

[0046] In operation, items to be cleaned are exposed to the cleaning solution, which causes a number of processes occur. The basic cleaning solution attacks the acids in dirt and oil. In a first reaction step, the gas-releasing agent reacts with dirt and oil. In a gas-releasing step, gas is released. In a cleaning appliance for washing clothing, dirt and oil would be dislodged from clothing in a removal step due to reaction and the sudden release of gas. In a second reaction step, the gas-releasing agent continues to react with removed soils.

[0047] Simultaneously, in a scavenging step, the softener scavenges ions to prevent the buildup of residue on the articles to be cleaned. In addition, the alkalinity agent keeps the pH of the cleaning solution slightly basic. This serves two functions. First of all, it limits the reaction of the gas-releasing agent so that the gas evolves at a controlled rate and the cleaning solution has time to become thoroughly intermixed with the articles to be cleaned. Second, the basic cleaning solution reacts to neutralize acids in the soils.

[0048] An exemplary cleaning process utilizing an exemplary cleaning agent will now be described. First, the sodium percarbonate and sodium carbonate attack acids within the dirt and oils. The acid-base reactions have an emulsifying affect on the dirt and oils. Particularly, sodium percarbonate (which includes sodium carbonate) reacts with acids to generate carbon dioxide in an acid and base reaction: $2H^+(aq) + Na_2CO_3(aq) \rightarrow 2Na^+(aq) + H_2O + CO_2(g)$. Most oils and dirts found in clothing are slightly acidic, and so the sodium carbonate component of the percarbonate may react with these dirts and oils to produce carbon dioxide. This tiny explosion of gas, as it bubbles out of solution, dislodges the dirt from clothes and other materials, allowing it to be washed away. The reaction yields sodium ions in solution, or the sodium salts of the oils and dirts of the reaction, water and carbon dioxide.

[0049] In this embodiment, the byproducts of the cleaning process appear in nature, so there is no need for the extensive treatment of phosphates and other non-biodegradable materials, as required by presently available detergents. However, the alkalinity agent, which may include sodium carbonate, is added primarily to increase the pH of the cleaning solution but also functions as a gas releasing agent, described above. In a similar manner, sodium percarbonate, is added primarily as a gas releasing agent but also increases the pH of the cleaning solution as an alkalinity agent.

[0050] The alkalinity agent provides a mildly basic solution to prevent the sodium percarbonate from reacting with excess hydrogen ions (H^+) in aqueous solution. Without the alkalinity agent, CO_2 would bubble out of solution too quickly as the sodium percarbonate reacts with random hydrogen ions. With a slightly alkaline cleaning solution, in one embodiment approximately 8.5 to 10 pH, the sodium percarbonate reacts at a controlled pace, and preferably with the acids in the dirts and oils.

[0051] The softener, which may be natural or synthetic zeolite, exchanges sodium ions (Na^+) for magnesium (Mg^{++}) and calcium (Ca^{++}) ions: $Mg^{++} + Ca^{++} + \text{zeolite} \rightarrow \text{zeolite} + 4Na^+$. Sodium ions and sodium salts are readily water soluble and will not form precipitates. Without the softener, the Mg^{++} and Ca^{++} could react to form insoluble salts, precipitating out of solution and leaving a hard film behind, as shown by the following equations: $NaHCO_3 + Mg^{++} \rightarrow MgCO_3$, and $NaHCO_3 + Ca^{++} \rightarrow CaCO_3$.

[0052] One possible method for making the cleaning agent in a solid state will be described. In the described method a solvent, a gas releasing agent, a solubility control agent, an alkalinity agent, and a softener, are combined to form the cleaning agent. It will be appreciated that the cleaning agent may be manufactured with some components performing multiple functions or with additional, unnamed agents.

[0053] The solvent may be included with the solubility control agent, if in liquid form. The solvent will typically be water, and may comprise from 1% to 50 by weight of the cleaning agent composition.

[0054] Referring to Figure 1, a multiuse cleaning device 10 is illustrated. The cleaning device 10 is shown in the form of a spherical ball. The ball does not need to be spherical, but it can take any practical, easily manufactured shape such as aspherical, oval, oblate, rounded, or other irregular shaped configuration.

[0055] As shown in Figure 2, the multiuse cleaning device 10 contains a homogeneous quantity of cleaning agent 12 in solid form. The cleaning agent 12 has a composition as described herein. In the embodiment shown in Figure 2, the cleaning device 10 is a solid mass of cleaning agent. The cleaning device is deposited within the laundry cleaning machine tub under conditions such that the laundry cleaning device is exposed to water from the plurality of laundry wash and rinse cycles. Under typical conditions, the cleaning device is deposited

within the tub or wash basin together with the soiled clothing, towels, linens, and similar articles (hereinafter referred to as "laundry articles"), to be laundered. Water from wash and rinse cycles dissolves a portion of the cleaning device and releases a controlled quantity of cleaning agent which is able to clean the laundry articles as described herein. Upon completion of the cleaning cycle, the clean laundry articles are removed, but the cleaning device may remain within the laundry cleaning machine tub for use in multiple cleaning cycles.

[0056] Referring to Figure 3, the cleaning device 10 may have a porous covering or bag 14 disposed around the solid cleaning agent 12. The porous covering or bag 14 may be elastic and conform to the size of the solid cleaning agent 12 as the cleaning agent shrinks in size due to dissolution of cleaning agent 12. The porous covering or bag 14 may be pliable or flexible and not necessarily conform tightly to the cleaning agent as it dissolves and shrinks in size. The covering 14 helps reduce or eliminate direct transfer of cleaning agent residue onto fabric surfaces after a final rinse cycle when the cleaning device and fabric surfaces are in contact for an extended time period. For example, users do not always remove laundry articles from the laundry cleaning machine as soon as the wash cycle is completed. Under such circumstances, the cleaning device 10 would contact moist fabric surfaces for a period of time. This may result in transfer of cleaning agent onto fabric surfaces. The porous covering or bag 14 provides a barrier which separates the cleaning agent 12 from the fabric surfaces. The covering 14 may be a net-like material or a woven fabric material. The covering 14 may include ruffles on the outer surface to create a greater separation distance between the cleaning agent 12 and clean or moist fabric surfaces.

[0057] Also shown in Figure 3 is an indicator structure 16 which indicates when it is time to replace a used cleaning device with a fresh cleaning device 10. The structure 16 may take a variety of different forms. For example, it may spherical, disk, rod, spiked, or irregular shaped. The important feature is that the structure be able to indicate, such as by a visible sign, that the cleaning device 10 should be replaced. The cleaning device 12 may include a support structure or internal skeleton disposed within the quantity of cleaning agent 12 to provide structural strength to the cleaning device.

[0058] EXAMPLES:

[0059] The following examples are given to illustrate various embodiments within the scope of the present invention. These are given by way of example only, and it is to be understood that the following examples are not comprehensive or exhaustive of the many embodiments within the scope of the present invention.

[0060] Example 1

[0061] A cleaning agent composition was prepared by mixing the dry ingredients listed in Table 1A with the wet ingredients listed in Table 1B:

[0062] Table 1A:

Dry Ingredients	Weight (g)	Weight Percent
Sodium perborate monohydrate	230 g	45.5
Optical brightener	5 g	1.0
Antiredeposition agent	5 g	1.0
Zeolite	15 g	3.0
Fragrance	22 g	2.2
Total:	267 g	52.7

[0063] Table 1B:

Wet Ingredients	Weight (g)	Weight Percent
Potassium Silicate	201 g	39.8
Sodium hydroxide	9 g	1.8
Surfactant	29 g	5.7
Total:	239 g	47.3

[0064] After the foregoing ingredients are mixed, the mixture is poured into a mold and allowed to cure and solidify.

[0065] Example 2

[0066] A multiuse laundry cleaning device in a solid state was prepared by molding cleaning agent having the formula of Example 1 into a spherical ball. The spherical ball was placed inside a washing machine tub and subjected to repeated wash cycles in the washing machine

tub. Additional multiuse laundry cleaning devices were prepared and tested in several different types of commercially available washing machines. Wash cycles ranged from delicate to regular to heavy duty, and different water temperature settings were used. The multiuse laundry cleaning device remained in the washing machine tub for both wash and rinse cycles. After the cleaning cycles were complete, the cleaning device was removed from the washing machine and weighed to determine the quantity of cleaning agent that was dissolved during the preceding wash cycle. Representative results from two tests are reported in Tables 2A and 2B.

[0067]

Table 2A

Wash Cycle	Cleaning Device Weight (g)	Cleaning Agent Released
0	422	
1	394	28
2	336	58
3	283	53
4	231	52
5	189	42
6	164	25
7	129	35
8	99	30
9	76	23
10	64	12
11	44	20
12	35	9
13	30	5
14	27	3
15	21	6

Table 2B

Wash Cycle	Cleaning Device Weight (g)	Cleaning Agent Released
0	435	
1	389	46
2	335	54
3	283	52
4	236	47
5	206	30
6	171	35
7	145	26
8	134	11
9	124	10
10	102	22

[0068] The average amount of cleaning agent released per wash cycle in Table 2A over 10 wash cycles was 35.8 g. The average amount of cleaning agent released per wash cycle in Table 2B over 10 wash cycles was 33.3.

[0069] Results from a test with more wash cycles are reported in Table 2C below:

[0070] Table 2C

Wash Cycle	Cleaning Device Weight (g)	Cleaning Agent Released
0	430	
1	401	29
2	366	35
3	336	30
4	306	30
5	281	25
6	252	29
7	238	14
8	218	20
9	193	25
10	179	14
11	157	22
12	137	20
13	122	15
14	103	19
15	78	25
16	64	14
17	46	18
18	31	15
19	11	20

[0071] The average amount of cleaning agent released per wash cycle in Table 2C over 19 wash cycles was 22.1 g. A graph of the results shown in Table 2C, grams of cleaning agent released per wash cycle load, is shown in Figure 4.

[0072] One cleaning agent composition within the scope of the invention has the following ingredients set forth in Table 3:

[0073] Table 3

Ingredient	Weight Percent
Water	29%
Sodium Bicarbonate	39%
Natural Zeolite	8%
Potassium silicate	21%
Sodium Sesquicarbonate	3%

[0074] Another cleaning agent composition within the scope of the present invention has the following ingredients set forth in Table 4:

[0075] Table 4

Ingredient	Weight Percent
Sodium Perborate Monohydrate	37.0%
Sodium Carbonate	31.2%
Natural Zeolite	8%
Optical Brightener	1.0%
Potassium silicate	22.8%

[0076] With the formula of Table 4, ingredients were added as listed. The powders (first four items) were combined and mixed prior to adding liquid potassium silicate. After adding the potassium silicate, the product was mixed briefly and poured into a mold. Set-up and hardening began within twenty minutes after the addition of the potassium silicate at room temperature.

[0077] The sodium perborate monohydrate and the sodium carbonate both release gas. The carbonate releases carbon dioxide and the perborate releases oxygen. The potassium silicate provides some solubility control. The sodium carbonate serves a dual role as gas releaser and alkalinity agent.

[0078] It has been found that potassium silicate may be used successfully, while sodium silicate is noticeably less-effective to prepare the cleaning agent. While not being bound by theory, it is believed that potassium silicate is operative because it does not raise the pH too high and does not dissolve in water as readily as sodium silicate. Potassium silicate has a pH of about 11, whereas sodium silicate has a pH of about 13. With this information, it may be possible to include a suitable pH modifier with sodium silicate to successfully prepare the cleaning agent.

[0079] Yet another cleaning agent composition within the scope of the present invention has the following ingredients set forth in Table 5:

[0080] Table 5

Ingredient	Weight Percent
Sodium Percarbonate	38%
Sodium Carbonate	25%
Carboxymethylcellulose	1%
Natural Zeolite	8%
Potassium silicate	28%

[0081] With the formula of Table 5, ingredients were added as listed. The powders (first four items) were combined and slowly mixed to minimize dusting, but mixed briskly enough to ensure total dispersion. The liquid potassium silicate was added slowly with the mixer running. As the product thickens, a small amount of base (sodium hydroxide, less than 0.5 weight percent) was added to aid in processing by thinning the material and allowing a longer mix time. After about 5 to 10 minutes, the product started to stiffen, and it was poured into a mold for curing. Set-up and hardening began within ten minutes after the addition of the potassium silicate at room temperature.

[0082] The carboxymethylcellulose is a soil anti-redeposition compound. The sodium percarbonate and the sodium carbonate both release gas. The carbonate releases carbon dioxide and the percarbonate releases oxygen. The potassium silicate provides some solubility control. The sodium carbonate serves a dual role as gas releaser and alkalinity agent. The amounts listed in Table 4 can be varied by a few weight percent.

[0083] The present invention may be embodied in other specific forms without departing from its structures, methods, or other essential characteristics as broadly described herein and claimed hereinafter. The described embodiments are to be considered in all respects only as illustrative, and not restrictive. The scope of the invention is, therefore, indicated by the appended claims, rather than by the foregoing description. All changes that come within the meaning and range of equivalency of the claims are to be embraced within their scope.

CLAIMS:

1. A multiuse laundry cleaning device in a solid state comprising a homogeneous quantity of cleaning agent in solid form configured to be disposed within a laundry cleaning machine tub and to dissolve and release a substantially consistent quantity of cleaning agent over a plurality of laundry wash and rinse cycles.

2. The multiuse laundry cleaning device according to claim 1, wherein the cleaning agent comprises a gas-releasing component, a solubility control component to limit the solubility of the cleaning agent, an alkalinity agent as a pH regulator, a water softener to solvate metal ions in a solution of water, and an optical brightener, wherein the solubility control component is present in an amount sufficient to cause the multiuse laundry cleaning device to dissolve in water and release a substantially consistent quantity of cleaning agent over a plurality of laundry wash and rinse cycles.

3. The multiuse laundry cleaning device according to claim 1, wherein the gas-releasing component is selected from the group consisting of carbonates, bicarbonates, perborates, percarbonates, and mixtures thereof and the solubility control component is potassium silicate, the alkalinity agent as a pH regulator.

4. The multiuse laundry cleaning device according to claim 1, wherein the gas-releasing component is present in an amount from 20% to 60% by weight, wherein the solubility control component is present in an amount from 20% to 60% by weight, wherein the water softener is present in an amount from 0.5% to 20% by weight, wherein the alkalinity agent is present in an amount from 0.5% to 20% by weight, and wherein the optical brightener is present in an amount from 0.5% to 8% by weight.

5. The multiuse laundry cleaning device according to claim 4, wherein the cleaning agent further comprises a fragrance component present in an amount from about 0.5 to 15 % by weight.

6. The multiuse laundry cleaning device according to claim 4, wherein the cleaning agent further comprises an anti-redeposition component present in an amount from about 0.5% to 10% by weight.

7. The multiuse laundry cleaning device according to claim 2, wherein the water softener is selected from the group consisting of ion exchange particles and salts of weak acids.

8. The multiuse laundry cleaning device according to claim 2, wherein the water softener is a natural or synthetic zeolite.

9. The multiuse laundry cleaning device according to claim 3, wherein the gas-releasing component is sodium perborate monohydrate.

10. The multiuse laundry cleaning device according to claim 3, wherein the gas-releasing component is sodium percarbonate.

11. The multiuse laundry cleaning device according to claim 3, wherein the gas-releasing component is sodium bicarbonate.

12. The multiuse laundry cleaning device according to claim 3, wherein the gas-releasing component is sodium carbonate.

13. The multiuse laundry cleaning device according to claim 3, wherein the alkalinity agent is selected from the group consisting of an alkali hydroxide, alkali hydride, alkali oxide, alkali sesquicarbonate, alkali carbonate, alkali phosphate, alkali borate, alkali salt of mineral acid, alkali amine, alkaloid, alkali cyanide, and mixtures thereof.

14. The multiuse laundry cleaning device according to claim 3, wherein the alkalinity agent is an alkali hydroxide.

15. The multiuse laundry cleaning device according to claim 3, wherein the alkalinity agent is present in an amount sufficient to give a solution of the composition a pH greater than 7.

16. The multiuse laundry cleaning device according to claim 3, wherein the alkalinity agent is present in an amount sufficient to give a solution of the composition a pH from about 7 to about 10.5.

17. The multiuse laundry cleaning device according to claim 1, further comprising a porous covering or bag disposed around the solid cleaning agent.

18. The multiuse laundry cleaning device according to claim 17, wherein the porous covering or bag conforms to the size of the solid cleaning agent as the cleaning agent shrinks in size due to dissolution of cleaning agent.

19. The multiuse laundry cleaning device according to claim 17, wherein the porous, covering or bag comprises a pliable fabric material.

20. The multiuse laundry cleaning device according to claim 1, further comprising a structure disposed within the quantity of cleaning agent to signal when to replace the cleaning device.

21. The multiuse laundry cleaning device according to claim 1, wherein the cleaning agent is in the form of a ball.

22. The multiuse laundry cleaning device according to claim 1, wherein the cleaning agent in solid form dissolves and releases a substantially consistent quantity of cleaning agent over from about 5 to 25 laundry wash or rinse cycles.

23. The multiuse laundry cleaning device according to claim 2, wherein the gas-releasing component is sodium perborate monohydrate present in an amount from 42% to 52% by weight, wherein the solubility control component is potassium silicate present in an amount from 35% to 45% by weight, wherein the water softener is a zeolite present in an amount from 1% to 5% by weight, wherein the alkalinity agent is sodium hydroxide present in an amount from 1% to 5% by weight, and wherein the optical brightener is present in an amount from 0.5% to 3% by weight.

24. The multiuse laundry cleaning device according to claim 23, wherein the cleaning agent further comprises:

a fragrance component present in an amount from about 1 to 5 % by weight; and

an anti-redeposition component present in an amount from about 0.5 to 3% by weight.

25. A method of providing laundry cleaning agent to a laundry cleaning machine comprising:

obtaining a multiuse laundry cleaning device in a solid state comprising a homogeneous quantity of cleaning agent in solid form comprising a gas-releasing component, a solubility control component to limit the solubility of the cleaning agent, an alkalinity agent as a pH regulator, a water softener to solvate metal ions in a solution of water, and an optical brightener, wherein the solubility control component is present in an amount sufficient to cause the multiuse laundry cleaning device to dissolve in water and release a substantially consistent quantity of cleaning agent over a plurality of laundry wash and rinse cycles; and

depositing the laundry cleaning device within the laundry cleaning machine tub under conditions such that the laundry cleaning device is exposed to water from the plurality of laundry wash and rinse cycles.

26. The method according to claim 25, wherein the gas-releasing component is selected from the group consisting of carbonates, bicarbonates, perborates, percarbonates, and mixtures thereof and the solubility control component is potassium silicate, the alkalinity agent as a pH regulator.

27. The method according to claim 25, further comprising the step of disposing the solid cleaning agent within a porous covering or bag.

28. The method according to claim 27, wherein the porous, covering or bag comprises a pliable fabric material.

29. The method according to claim 27, wherein the porous covering or bag conforms to the size of the solid cleaning agent as the cleaning agent shrinks in size due to dissolution of cleaning agent.

30. The method according to claim 25, wherein the cleaning agent in solid form further comprises a structure disposed within the quantity of cleaning agent to signal when to replace the cleaning device.

31. The method according to claim 25, wherein the cleaning agent in solid form is in the form of a ball.

32. The method according to claim 25, wherein the gas-releasing component is present in an amount from 20% to 60% by weight, wherein the solubility control component is present in an amount from 20% to 60% by weight, wherein the water softener is present in an amount from 0.5% to 20% by weight, wherein the alkalinity agent is present in an amount from 0.5% to 20% by weight, and wherein the optical brightener is present in an amount from 0.5% to 8% by weight.

33. The method according to claim 32, wherein the cleaning agent further comprises:

a fragrance component present in an amount from about 0.5 to 15 % by weight; and

an anti-redeposition component present in an amount from about 0.5% to 10% by weight.

34. The method according to claim 25, wherein the gas-releasing component is sodium perborate monohydrate present in an amount from 42% to 52% by weight, wherein the solubility control component is potassium silicate present in an amount from 35% to 45% by weight, wherein the water softener is a zeolite present in an amount from 1% to 5% by weight, wherein the alkalinity agent is sodium hydroxide present in an amount from 1% to 5% by weight, and wherein the optical brightener is present in an amount from 0.5% to 3% by weight.

ABSTRACT OF THE DISCLOSURE

[0084] A multiuse laundry cleaning device in a solid state containing a homogeneous quantity of cleaning agent configured to dissolve and release a substantially consistent quantity of cleaning agent over a plurality of laundry wash and rinse cycles. The cleaning agent includes a gas-releasing component, potassium silicate as a solubility control component to limit the solubility of the cleaning agent, an alkalinity agent as a pH regulator, and a water softener to solvate metal ions in a solution of water. Controlled dissolution of the cleaning agent composition releases a desired quantity of cleaning agent in each cleaning cycle over a plurality of cycles. A porous covering or bag may be disposed around the solid cleaning agent.

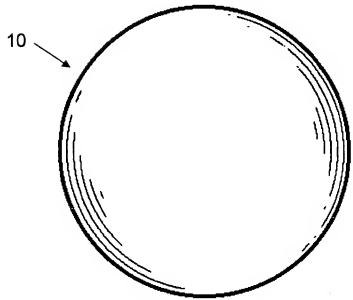

Fig. 1

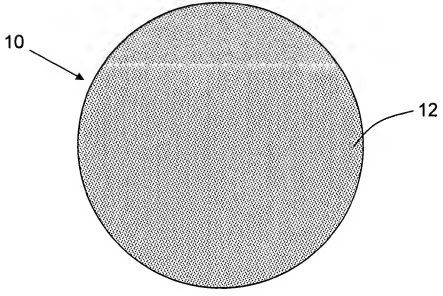

Fig. 2

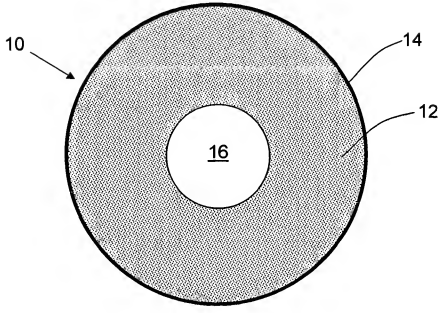

Fig. 3

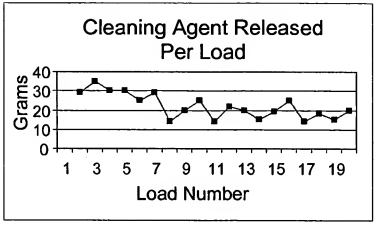
Cleaning Agent Released
Per Load
Grams
40
30
20
10
0
1 3 5 7 9 11 13 15 17 19
Load Number

Fig. 4

DECLARATION FOR UTILITY OR DESIGN PATENT APPLICATION (37 CFR 1.63)	Attorney Docket Number	2839.2.10
	First Named Inventor	K Donald Evans
	COMPLETE IF KNOWN	
	Application Number	
	Filing Date	
	Group Art Unit	
	Examiner Name	

☒Declaration Submitted With Initial Filing OR ☐Declaration Submitted after Initial Filing (surcharge (37 CFR 1.16 (e)) required)

I hereby declare that:

Each inventor's residence, mailing address, and citizenship are as stated below next to their name.

I believe the inventor(s) named below to be the original and first inventor(s) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

MULTIUSE, SOLID CLEANING DEVICE AND COMPOSITION

(Title of the Invention)

the specification of which

☒ is attached hereto

OR

☐ was filed on (MM/DD/YYYY) [ ] as United States Application Number or PCT International

Application Number [ ] and was amended on (MM/DD/YYYY) [ ] (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims as amended by any amendment specifically referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 CFR 1.56, including for continuation-in-part applications, material information which became available between the filing date of the prior application and the national or PCT international filing date of the continuation-in-part application.

I hereby claim foreign priority benefits under 35 U.S.C. 119(a)-(d) or (f), or 365(b) of any foreign application(s) for patent, inventor's or plant breeder's rights certificate(s), or 365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below, by checking the box, any foreign application for patent, inventor's or plant breeder's rights certificate(s), or of any PCT international application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application Number(s)	Country	Foreign Filing Date (MM/DD/YYYY) Country	Priority Not Claimed	Certified Copy Attached? YES	NO
			☐	☐	☐
			☐	☐	☐
			☐	☐	☐
			☐	☐	☐
			☐	☐	☐

☐ Additional foreign application numbers are listed on a supplemental priority data sheet PTO/SB/02B attached hereto:

DECLARATION — Utility or Design Patent Application

I hereby appoint:

☒ Practitioners associated with the Customer Number: 21552

OR

☐ Practitioner(s) named below:

Name	Registration Number

as my attorney(s) or agent(s) to prosecute the application identified above, and to transact all business in the Patent and Trademark Office connected therewith.

Direct all correspondence to: ☒ Customer Number 21552 *OR* ☐ Correspondence address below

Name Evan R. Witt

Address

City	**State**	**ZIP**
Country	**Telephone**	**Fax**

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. 1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

NAME OF SOLE OR FIRST INVENTOR: ☐ A petition has been filed for this unsigned inventor

Given Name (first and middle [if any])	**Family Name or Surname**
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Inventor's Signature K Donald Evans **Date** 8-17-04

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NAME OF SECOND INVENTOR: ☐ A petition has been filed for this unsigned inventor

Given Name (first and middle [if any])	**Family Name or Surname**
Cory E.	Cook

Inventor's Signature **Date** 8-17-04

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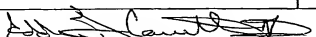
Riverton	Utah	84065	United States

☐ Additional Inventors are being named on the ___ supplemental Additional Inventor(s) sheet(s) PTO/SB/02A attached hereto.

PTO/SB/02A (08-03)
Approved for use through 07/31/2006. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

DECLARATION

ADDITIONAL INVENTOR(S)
Supplemental Sheet

Name of additional joint inventor, if any	☐ A petition has been filed for this unsigned inventor
Given Name (first and middle [if any])	Family Name or Surname
Eddie	Caruthers, Jr.
Inventor's Signature 	Date 8 | 23 | 04
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